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CONDITION SURVEY, ALTUS AIR FORCE BASE, OKLAHOMA.(U)
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CONDITION SURVEY, ALTUS AIR FORCE BASE, OKLAHOMA

by

R. D. Jackson

April 1973

Sponsored by Office, Chief of Engineers, U. S. Army

Conducted by U. S. Army Engineer Waterways Experiment Station
Soils and Pavements Laboratory
Vicksburg, Mississippi

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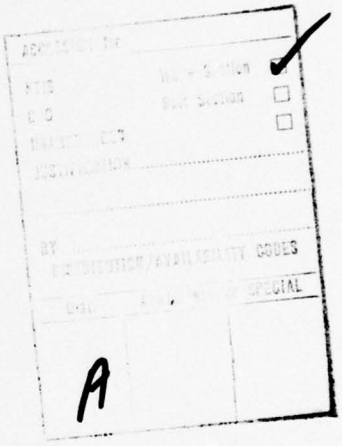

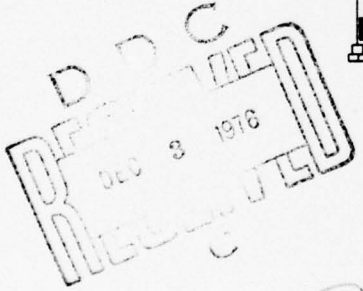

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Soils and Pavements Laboratory
Vicksburg, Mississippi

Foreword

The study reported herein was conducted under the general supervision of the Engineering Design Criteria Branch, Soils and Pavements Laboratory, of the U. S. Army Engineer Waterways Experiment Station (WES), Vicksburg, Mississippi. WES personnel involved in this condition survey were Messrs. R. D. Jackson, K. A. O'Connor, and S. R. Rowland. This report was prepared by Mr. Jackson under the general supervision of Messrs. J. P. Sale, R. G. Ahlvin, R. L. Hutchinson, and P. J. Vedros of the Soils and Pavements Laboratory.

COL Ernest D. Peixotto, CE, was Director of the WES during the conduct of the study and preparation of the report. Mr. F. R. Brown was Technical Director.

Contents

Conversion Factors, British to Metric Units of Measurement

British units of measurement used in this report can be converted to metric units as follows:

Multiply	By	To Obtain
inches	2.54	centimeters
feet	0.3048	meters
miles (U. S. statute)	1.609344	kilometers
square inches	6.4516	square centimeters
pounds (mass)	0.45359237	kilograms
pounds (force) per square inch	0.6894757	newtons per square centimeter
Fahrenheit degrees	*	Celsius or Kelvin degrees

* To obtain Celsius (C) temperature readings from Fahrenheit (F) readings, use the following formula: $C = (5/9)(F - 32)$. To obtain Kelvin (K) readings, use: $K = (5/9)(F - 32) + 273.15$.

CONDITION SURVEY, ALTUS AIR FORCE BASE, OKLAHOMA

Authority

1. Authority for conducting condition surveys at selected airfields is contained in amendment to FY 1972 RDTE Funding Authorization (MFS-MC-5, 16 February 1972), subject: "Air Force Airfield Pavement Research Program," from the Office, Chief of Engineers, U. S. Army, Directorate of Military Construction, dated 18 February 1972.

Purpose and Scope

2. The purpose of this report is to present the results of a condition survey performed at Altus Air Force Base (AAFB), Oklahoma, during 14-17 May 1972. The following three major areas of interest were considered in this condition survey:

(1) The structural condition of the primary airfield pavements.

(2) The condition of pavement repairs and the types of maintenance materials that have been used at this airfield.

(3) Any detrimental effects of frost to the pavement facilities.

3. This report is limited to a presentation of visual observations of the pavement conditions, discussion of these observations, and pertinent remarks with regard to the performance of the pavements. No physical tests of the pavements, foundations, or patching materials were performed during this survey.

Pertinent Background Data

General description of airfield

4. AAFB is located in Jackson County, Oklahoma, approximately

2 miles* east of Altus, Oklahoma. A vicinity map is shown in plates 1 and 2.

5. In May 1972, the airfield facilities consisted of a N-S (17-35) runway, a primary taxiway, three large parking aprons, two operational aprons, two wash racks, SAC alert facilities, connecting taxiways from the runway to the primary taxiway, and two warm-up aprons. The runway was 300 ft wide and 13,440 ft long; the primary taxiway was 75 ft wide and 14,354 ft long; the north parking apron was 772 ft wide and 1,500 ft long; the center parking apron was 657 ft wide and 2,000 ft long; the south parking apron was 522 ft wide and 2,300 ft long; and the warm-up aprons were variable in size. A layout of the airfield is shown in plate 1. A pavement plan indicating the type pavement on each facility is shown in plate 2.

Previous reports

6. Previous reports concerning the airfield facilities at AAFB are listed below. Pertinent data were extracted from them for use in this condition survey.

7. Condition survey reports:

   a. Ohio River Division Laboratories, CE, "Report of Rigid Pavement Condition Survey and Evaluation, Altus Municipal Airfield, Altus, Oklahoma," February 1952, Cincinnati, Ohio.

   b. _____, "Report of Rigid Pavement Condition Survey, Altus Air Force Base, Oklahoma," October 1960, Mariemont, Ohio.

   c. _____, "Condition Survey Report, Altus Air Force Base, Oklahoma," October 1965, Cincinnati, Ohio.

8. Pavement evaluation reports:

   a. U. S. Army Engineer District, Denison, CE, "Airfield Pavement Evaluation, Altus Army Airfield, Altus, Oklahoma," July 1944, Denison, Texas.

   b. U. S. Army Engineer Waterways Experiment Station, CE, "Airfield Pavement Evaluation, Altus Air Force Base, Oklahoma, and Detailed Report Complete with Supporting Data," August 1959, Vicksburg, Mississippi.

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* A table of factors for converting British units of measurement to metric units is presented on page vii.

c. U. S. Army Engineer District, Tulsa, CE, "Airfield Evaluation Report for Altus Air Force Base, Altus, Oklahoma," April 1960, Tulsa, Oklahoma.

History of Airfield Pavements

Design and construction history

9. The pavements now in use at AAFB were designed to support two different loadings. From sta 0+00 to 3+00 and from sta 124+40 to 134+40, the N-S (17-35) runway pavement was designed to support a 100,000-lb gear load on twin wheels spaced 37 in. center to center. The remainder of the runway was designed to support a 240,000-lb gear load on twin-twin wheels spaced 37-62-37 in. The primary taxiway system was designed to support the 240,000-lb gear load, except for 3,449 ft of the primary taxiway (sta 106+33 to 140+82), which was designed for the 100,000-lb gear load. All the aprons were designed to support a 240,000-lb gear load, except the operational aprons, which were designed for the 100,000-lb gear load.

10. Details of the construction history of the airfield pavements (extracted from the reports referenced in paragraphs 7 and 8) are presented in table 1. Pavement thicknesses, descriptions, and other details are presented in table 2.

Traffic history

11. The N-S runway was opened in January 1954, with traffic consisting principally of rather intensive operations of B-36, KC-97, and B-47 aircraft. The B-47 aircraft, which had replaced the B-36, were transferred from the airfield in September 1956. In February 1958, B-52 aircraft began operations at AAFB that continued for approximately 5 months; however, these aircraft were then transferred to another base while the runway pavement was being reconstructed. The B-52 aircraft returned to the airfield in November 1958. From November 1958 through December 1959, the runway was subjected to 2,797 cycles* of B-52 traffic and 2,444 cycles of KC-135 traffic. From 1960 to 1968, the runway was subjected to approximately 8,500 cycles of B-52 traffic and 10,200 cycles

* A cycle of traffic is one landing and takeoff.

of KC-135 traffic. From November 1958 through 1968, the runway was subjected to approximately 27,000 cycles of traffic of other types of aircraft. During this same period, a number of alert exercises were conducted with B-52 and KC-135 aircraft. The alert exercises were performed at aircraft gross weights of about 455,000 lb for the B-52 and about 300,000 lb for the KC-135. During the alert exercises, the aircraft taxied from the alert facilities down the length of the runway and then returned to the alert facilities along the primary taxiway. Since 1968, the airfield has been used as a transition training base for C-141 and C-5A pilots and flight engineers. Records of these training flights were not available; however, it is reasonable to assume that the amount of traffic applied during them has been quite significant.

Climate and drainage

12. AAFB is located in a semiarid region having moderate winters. However, during the winter months, light snowfalls and short periods of freezing temperatures do occur. The average annual rainfall is 23.5 inches, and the average annual snowfall is approximately 7.0 inches. The maximum depth of frost penetration is considered too small to be a design consideration. Climatic data compiled by the U. S. Air Force Weather Squadron at AAFB are presented in table 3. The rolling topography of the area provides good drainage away from all sides of the airfield. A storm sewer system collects the surface drainage and discharges it into open ditches outside the airfield limits. Subsurface drainage was installed along the edges of pavements constructed during 1952 to 1954. This subsurface drainage consisted of perforated pipe in a French-type drain.

Conditions of Pavement Surfaces

Pavement inspection procedure

13. The following procedure was used in inspecting the rigid pavements. Representative features were selected for detailed inspection. The features were then inspected slab* by slab, and the defects

* A slab is the smallest unit, containing no joints, of a given pavement feature.

were recorded. The locations of the individual pavement features, the inspection starting points, and the directions in which the pavements were inspected are shown in plate 1. The results of the rigid pavement survey for the features that were inspected in detail are presented in table 4. This table shows a quantitative breakdown of the various types of defects and a condition rating for each pavement feature. The procedures used for determining the condition rating of a pavement are described in Appendix III, Department of the Army Technical Manual TM 5-827-3, "Rigid Airfield Pavement Evaluation," dated September 1965.

Runway

14. The portland cement concrete (PCC) pavements were rated as being in excellent condition. Feature R1A (16-in. PCC) had only one major defect. Features R2A and R3D (23- and 21-in. PCC, respectively) contained no major defects. Only two major defects were noted in features R4B and R6C (21- and 19-in. PCC, respectively). The first 1000 ft of the north end of the runway (16-in. PCC) contained only nine major defects. Two slabs on either side of the center line, approximately 675 ft from the north end, were replaced in 1961.

Taxiways

15. Taxiway 5, the primary taxiway (features T1A, T2A, T3A, and T4A), was rated as being in excellent condition, with only 11 major defects for the 4 features. In 1965, 3 slabs in the 16-in. pavement area (feature T1A) were replaced. They were located at the north end, adjacent to the north warm-up apron. Photo 1 shows damage to the PCC pavement on the south end of taxiway 5 due to jet engine blast. No major defects were noted in the SAC alert taxiways and stubs (features T11B and T12B). All other PCC taxiways were rated as being in excellent condition.

Aprons

16. The condition of the apron system was rated as very good to excellent. The condition of the operational apron (feature A10B) was rated very good, with only about 5 percent of the slabs containing major defects. The parking aprons (features A1B, A2B, A3B, A4B, A5B, A6B, A7B, A8B, A9B, and A11B) contained only 13 major defects. Thin

bonded PCC overlays, 1 to 3 in. thick, were applied to 24 slabs in the center apron (feature A48) in 1962 to repair damage caused by a fire. Photo 2 shows the condition of one of the fire-damaged slabs. Most of the overlays contained small shrinkage cracks (see photos 3 and 4), and some were not completely bonded to the underlying slabs. The north warm-up apron (feature A12B) had only 5 slabs containing major defects, and its condition was rated as excellent. In 1965, 17 slabs were replaced in the north warm-up apron. The operational apron had 38 slabs replaced in 1965. It is reasonable to assume that this slab replacement was required because of channelized traffic.

17. The asphaltic concrete (AC) portion of the runway on both sides of the 75-ft keel section was rated as being in good condition, even though there was some cracking. The AC area adjacent to the center wing parking apron and south of taxiway 2 was rated as being in poor condition due to cracking and rutting (photos 5 and 6). This area is scheduled for replacement in the near future. The remaining pavement features not specifically mentioned above were rated as being in good to excellent condition.

Maintenance

18. Maintenance of the airfield pavements at AAFB has generally consisted of joint sealing of the PCC pavements and slurry sealing of the AC pavements. It has been necessary to replace 60 of the PCC slabs, and the AC pavement in the area between the center parking apron and taxiway 5 and north of taxiway 2 has been replaced due to rutting caused by the taxiing of C-141 and C-5A aircraft across the area. Listed below are maintenance costs at the airfield since 1961.

FY	Cost
1961	$ 19,996
1962	47,573
1963	146,406
1964	100,142
1965	8,489
1966	23,951

(Continued)

FY	Cost
1967	$171,890
1968	81,997
1969	34,536
1970	86,572
1971	209,114
1972 (3 quarters)	92,213

Evaluation

19. A summary of the pavement evaluation is given in table 5. Previously published pavement evaluations were updated to eliminate aircraft that are no longer in the Air Force inventory and to include aircraft that have been added to the inventory since the last pavement evaluation. The evaluation is based on the pavement thicknesses, flexural strengths (for PCC), base and subbase thicknesses and strengths, strengths of the subgrade (CBR or k values), and the structural condition of the pavement.

Table 1

Airfield Construction History

Pavement Facility	Dimensions Length ft	Dimensions Width ft	Pavement Thickness in.	Pavement Type	Construction Year(s)	Construction Agency
Taxiway 3 (original)	1,140±	150	2-1/2	AC	1942-43	USED*
Parking apron (original)	5,800	375	6	PCC	1942-43	USED
Parking apron (original outside edge)	5,800	150	2-1/2	AC	1942-43	USED
Taxiway 2	850	75	4	AC	1952	CE**
Taxiway 3 (original)	1,450±	75	4	AC	1952, 1954	CE
Taxiway 3 (reconstruction)	1,450±	150	4	AC	1952, 1954	CE
Taxiway 4 (original)	809±	75	4	AC	1952, 1954	CE
Taxiway 5 (original) sta 74+33 to 106+33	3,200	75	4	AC	1952, 1954	CE
South warm-up apron	450	280	4	AC	1952, 1954	CE
Parking apron (original) strengthened	5,800	525	4	AC	1952, 1954	CE
N-S runway (original) sta 0+00 to 108+00	10,800	200	4	AC	1952, 1954	CE
South wing parking apron wash rack	250	150	16	PCC	1954	CE
Taxiway 5 (original)						
Sta -2+72 to 74+33	7,705	75	3	AC	1955	CE
Sta 106+33 to 132+73	2,640	75	18	PCC	1955	CE
Sta 132+73 to 140+82	809	75	16	PCC	1955	CE
Taxiway 1	1,700	75	18	PCC	1955	CE
North wing parking apron (widening)	1,500	125	16	PCC	1955	CE
Operational aprons	Variable	Variable	16	PCC	1955	CE
Parking apron between center wing and taxiway 5	Variable	135	4	AC	1955	CE
Hangar access aprons	550	Variable	14	PCC	1955	CE
Calibration hardstand (circular)	--	--	16	PCC	1955	CE
Calibration hardstand taxiway	1,100	75	4	AC	1955	CE
N-S runway						
Sta 0+00 to 108+00 (widening)	10,800	100	4	AC	1955	CE
Sta 108+00 to 124+40 (extension)	1,640	200	4	AC	1955	CE
Sta 124+40 to 134+40 (extension)	1,000	300	16	PCC	1955	CE
N-S runway (reconstruction) sta 0+00 to 3+00	300	300	16	PCC	1956	AF
North warm-up apron	Variable	Variable	16	PCC	1956	CE
North wing parking apron (extension)	1,500	100	16	PCC	1956	CE
North wing parking apron channelized traffic lane	1,500	75	18-16	PCC	1956	CE
South wing parking apron (reconstruction)	2,300	447	21	PCC	1956-57	CE
South wing parking apron channelized traffic lane (reconstruction)	2,300	75	26, 24	PCC	1956-57	CE
Center wing parking apron (reconstruction)	2,000	475	21	PCC	1956-57	CE
	1,700	47	19	PCC	1956-57	CE
North wing parking apron (reconstruction)	1,500	472	19	PCC	1956-57	CE
Taxiway 2 (reconstruction)	850	75	21	PCC	1957-58	CE
Taxiway 5 (reconstruction) sta -2+72 to 106+33	10,905	50	23	PCC	1957-58	CE
N-S runway (reconstruction)						
Sta 3+00 to 5+00	200	300	23, 21	PCC	1956, 1958	CE
Sta 5+00 to 10+00	500	75	21	PCC	1956, 1958	CE
Sta 10+00 to 124+40	11,440	75	19	PCC	1956, 1958	CE
Alert facilities	Variable	Variable	26	PCC	1959	CE
Taxiway 3 (reconstruction)	850	75	15	PCC	1970	AF

* U. S. Engineer District

** Corps of Engineers

Table 2

SUMMARY OF PHYSICAL PROPERTY DATA

FACILITY (Altus AFB, Oklahoma)			OVERLAY PAVEMENT			PAVEMENT			BASE			SUBGRADE		GENERAL CONDITION OF AREA CONSIDERED
FACILITY NUMBER AND IDENTIFICATION	LENGTH FT	WIDTH FT	THICK. IN.	DESCRIPTION	FLEX. STR PSI	THICK. IN.	DESCRIPTION	FLEX. STR PSI	THICK. IN.	CLASSIFICATION	CBR OR K	CLASSIFICATION	CBR OR K	
01A 9-8 runway, E end; 300 ft of 1st 500 ft	300	300				16	Portland cement concrete	600	6	Sandy silt (SM)		Lean clay (CL)	125	Excellent
02A 9-8 runway, E end; 200 ft of 1st 500 ft, center portion	200	100				23	Portland cement concrete	750	6	Cement treated		Lean clay (CL)	125	Excellent
03A 9-8 runway, E end; outside edges of 200 ft of 1st 500 ft	200	200				21	Portland cement concrete	750	6	Cement treated		Lean clay (CL)	125	Excellent
04A 9-8 runway, E end; center 75 ft of 2nd 500 ft	500	75				21	Portland cement concrete	750	6	Cement treated		Lean clay (CL)	125	Excellent
05D 9-8 runway, E end; outside 112.5 ft each side, 2nd 500 ft	500	225				4	Asphaltic concrete		6 5 6 11	Base-gravelly clay (GC), gravel, silty, clayey (GM-GC) Subbase #3 lean clay (CL, sandy, silt, clay (SM-SC) Subbase #2 sandy silt (SM) Subbase #1 lean clay (CL, silty, sandy, clay (ML-CL)	60 35 40 20	Lean clay (CL)	6	Excellent
06D 9-8 runway; interior portion 75 ft center	11,440	75				19	Portland cement concrete	750	6	Cement treated		Sandy and lean clay (MC-CL)	125	Excellent
07S 9-8 runway interior; outside edges, sta 10+00 to 77+00	6,700	225				4	Asphaltic concrete		6 5 6 7	Base-gravelly clay (GC), gravelly, silty, clayey (GM-GC) Subbase #3 lean clay (CL, sandy, silt, clayey (SM-SC) Subbase #2 sandy silt (SM) Subbase #1 lean clay (CL silty, sandy, clay (ML-CL)	60 35 40 20	Lean clay (CL)	6	Excellent
08D 9-8 runway interior; outside edges, sta 77+00 to 95+00 and sta 108+00 to 124+50	3,750	225				4	Asphaltic concrete		6 5 6 3	Base-gravel (GP) gravel, silty (GP-GM) Subbase #3 gravel, silt (GM) sandy silt (SM) Subbase #2 sandy silt (SM) Subbase #1 sandy silt (SM) sandy silt, clayey (SM-SC)	90 70 40 20	Sandy and lean clays (SC) (CL)	12	Excellent
09D 9-8 runway interior; outside edges, sta 95+00 to 108+00	1,000	225				4	Asphaltic concrete		6 5 6 5	Base-gravelly clay (GC) gravel, silty clayey (GM-SC) Subbase #3 lean clay (CL) sandy silt clayey (SM-SC) Subbase #2 sandy silt (SM) Subbase #1 lean clay (CL) silty, sandy clay (ML-CL)	60 35 40 20	Sandy and lean clays (SC) (CL)	12	Excellent

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Table 8 (Continued)

SUMMARY OF PHYSICAL PROPERTY DATA

FACILITY			OVERLAY PAVEMENT			PAVEMENT			BASE			SUBGRADE		GENERAL CONDITION OF AREA CONSIDERED
Alton AFB, Oklahoma FACILITY NUMBER AND IDENTIFICATION	LENGTH FT	WIDTH FT	THICK. IN.	DESCRIPTION	FLEX. STR PSI	THICK. IN.	DESCRIPTION	FLEX. STR PSI	THICK. IN.	CLASSIFICATION	CBR OR K	CLASSIFICATION	CBR OR K	
R10A N-S runway, N end; 1st 500 ft	500	300				16	Portland cement concrete	700	4	Sandy silt (SM) sandy, silt, clayey (SM-SC)		Lean clay (CL) silty, sandy clay (ML-CL)	125	Excellent
R11B N-S runway, N end; 2nd 500 ft	500	300				16	Portland cement concrete	700	4	Sandy silt (SM) sandy, silt, clayey (SM-SC)		Lean clay (CL) silty, sandy, clay (ML-CL)	125	Excellent
T1A Taxiway 5 sta 130+73 to 140+82	809	75				16	Portland cement concrete	700	4	Sandy silt (SM) sandy, silt, clayey (SM-SC)		Lean clay (CL) silty, sandy clay (ML-CL)	125	Excellent
T2A Taxiway 5 sta 106+33 to 132+73	2,640	75				16	Portland cement concrete	700	4	Sandy silt (SM) sandy, silt, clayey (SM-SC)		Lean clay (CL) silty, sandy clay (ML-CL)	125	Excellent
T3A Taxiway 5 sta 74+33 to 106+33, center	3,200	50				23	Portland cement concrete	750	6	Cement treated		Lean clay (CL) silty, sandy clay (ML-CL)	125	Excellent
T4A Taxiway 5 sta -2+70 to 74+33, center	7,705	50				23	Portland cement concrete	750	6	Cement treated		Lean clay (CL) silty, sandy clay (ML-CL)	75	Excellent
T5B Taxiway 5 sta 74+33 to 106+33 outside edges	3,200	25				4	Asphaltic concrete		6 5 6 5	Base-gravelly clay (GC) gravel, silty, clayey (SM-SC) Subbase #3 lean clay (CL), sandy silt, clayey (SM-SC) Subbase #2 sandy silt (SM) Subbase #1 lean clay (CL), silty sandy clay (ML-CL)	60 35 40 20	Lean clay (CL) silty clay (ML-CL)	12	Excellent
T6B Taxiway 5 sta -2+70 to 74+33 outside edges	7,705	25				4	Asphaltic concrete		6 5 6 11	Base-gravelly clay (GC) gravel, silty clay (SM-SC) Subbase #3 lean clay (CL), sandy silt, clayey (SM-SC) Subbase #2 sandy silt (SM) Subbase #1 lean clay (CL), silty sandy clay (ML-CL)	60 40 40 20	Lean clay (CL)	6	Excellent
T7C Taxiway 2	850	75				21	Portland cement concrete	750	6	Cement treated		Lean clay (CL)	75	Excellent
T8C Taxiway 3	850	75				15	Portland cement concrete	650	6	Cement stabilized graded crushed aggregate		Lean clay (CL)	75	Excellent
T9C Taxiway 4	809	75				4	Asphaltic concrete		6 5 6 5	Base-gravelly clay (GC) gravel, silty, clayey (SM-SC) Subbase #3 lean clay (CL), sandy silt, clayey (SM-SC) Subbase #2 sandy silt (SM) Subbase #1 lean clay (CL), silty sandy clay (ML-CL)	60 35 40 20	Sandy and lean clays (SC) (CL)		Very good
T10B Taxiway 1	1,430	75				18	Portland cement concrete	700	4	Sandy clay (SC) sandy silt, clayey (SM-SC)		Lean clay (CL) sandy silt, clayey (SM-SC)	75	Excellent

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Table 2 (Continued)

SUMMARY OF PHYSICAL PROPERTY DATA

FACILITY Altus AFB, Oklahoma			OVERLAY PAVEMENT			PAVEMENT			BASE			SUBGRADE		GENERAL CONDITION OF AREA CONSIDERED
FACILITY NUMBER AND IDENTIFICATION	LENGTH FT	WIDTH FT	THICK IN.	DESCRIPTION	FLEX STR PSI	THICK IN.	DESCRIPTION	FLEX STR PSI	THICK IN.	CLASSIFICATION	CBR OR K	CLASSIFICATION	CBR OR K	
A11B Taxiway 6 and stubs	variable	variable				26	Portland cement concrete	725	6	Crushed granite and pit sand (GW)		Sandy and lean clays (SC) (CL)	100	Excellent
A12B Taxiway 7 and stubs	variable	variable				26	Portland cement concrete	725	6	Crushed granite and pit sand (GW)		Sandy and lean clays (SC) (CL)	100	Excellent
A1B South wing parking apron	2,300	variable				21	Portland cement concrete	750	4	Gravel silt (GM) gravel, silty, clayey (GM-GC)		Sandy and lean clays (SC) (CL)	75	Excellent
A2B South wing parking apron channelized traffic lane	2,300	25				26	Portland cement concrete	750	4	Gravel silt (GM) gravel, silty, clayey (GM-GC)		Sandy and lean clays (SC) (CL)	75	Excellent
A3B South wing parking apron channelized traffic lane	2,300	25 each side				24	Portland cement concrete	750	4	Gravel silt (GM) gravel, silty, clayey (GM-GC)		Sandy and lean clays (SC) (CL)	75	Excellent
A4B Center wing parking apron	2,000	475				21	Portland cement concrete	750	4	Gravel silt (GM) gravel, silty, clayey (GM-GC)		Sandy and lean clays (SC) (CL)	75	Excellent
A5B West side of center wing parking apron	1,700	47				19	Portland cement concrete	750	6	Gravel silt (GM) gravel, silty, clayey (GM-GC)		Sandy and lean clays (SC) (CL)	125	Excellent
A6B East side of center wing parking apron	variable	135				4	Asphaltic concrete		6 5 6 11	Base-gravelly clay (GC) gravel, silty clayey (GM-GC) Subbase #3 lean clay (CL), sandy silt, clayey (SM-SC) Subbase #2 sandy silt (SM) Subbase #1 lean clay (CL), silty sandy clay (ML-CL)	60 40 40 40	Lean clay (CL)	6	Good
A7B North wing parking apron	1,500	472				19	Portland cement concrete	750	6	Gravel silt (GM) gravel, silty, clayey (GM-GC)		Sandy and lean clays (SC) (CL)	125	Excellent
A8B North wing parking apron extension	1,500	275				16	Portland cement concrete	695	4	Sandy silt (SM) sandy silt, clayey (SM-SC)		Lean clay (CL) and silty, sandy clay (ML-CL)	125	Excellent
A9B North wing parking apron channelized traffic lane	1,500	25				18	Portland cement concrete	695	4	Sandy silt (SM) sandy silt, clayey (SM-SC)		Lean clay (CL) and silty, sandy clay (ML-CL)	125	Excellent
A10B Operational aprons and wash rack	variable	variable				16	Portland cement concrete	700	4	Sandy silt (SM) sandy silt, clayey (SM-SC)		Lean clay (CL) and silty, sandy clay (ML-CL)	75	Very good
A11B South wing wash rack	250	150				16	Portland cement concrete	700	4	Sandy silt (SM) sandy silt, clayey (SM-SC)		Lean clay (CL) and silty, sandy clay (ML-CL)	75	Excellent
A12B North warm-up apron	variable	variable				16	Portland cement concrete	700	4	Sandy silt (SM) sandy silt, clayey (SM-SC)		Lean clay (CL) and silty, sandy clay (ML-CL)	75	Excellent

WES FORM 1000
MAR 1958

Table 2 (Continued)

SUMMARY OF PHYSICAL PROPERTY DATA

FACILITY			OVERLAY PAVEMENT			PAVEMENT			BASE			SUBGRADE		GENERAL CONDITION OF AREA CONSIDERED
Altus AFB, Oklahoma FACILITY NUMBER AND IDENTIFICATION	LENGTH FT	WIDTH FT	THICK IN.	DESCRIPTION	FLEX. STR PSI	THICK IN.	DESCRIPTION	FLEX. STR PSI	THICK IN.	CLASSIFICATION	CBR OR K	CLASSIFICATION	CBR OR K	
A13B South warm-up apron	450	280				4	Asphaltic concrete		6 5 6 11	Base-gravelly clay (GC) gravel, silty, clayey (GM-GC) Subbase #3 lean clay (CL), sandy silt, clayey (SM-SC) Subbase #2 sandy silt (SM) Subbase #1 lean clay (CL), silty, sandy clay (ML-CL)	60 40 40 20	Lean clay (CL)	6	Very good
A14B Hangar access apron	550	variable				14	Portland cement concrete		4	Sandy clay (SC) sandy silt, clayey (SM-SC)		Lean clay and silty clay (CL) (ML)	75	Excellent
B12X N-S runway overrun, S end	850	300				2	Double bituminous surface treatment		18	Base course		Lean clay (CL)		Very good
B13X N-S runway blast pad, S end	150	300				2	Asphaltic concrete surface course		24	Base course		Lean clay (CL)		Very good
B14X N-S runway overrun, N end	850	300				2	Double bituminous surface treatment		18	Base course		Lean clay (CL)		Very good
B15X N-S runway blast pad, N end	150	300				2	Asphaltic concrete surface course		16	Base course		Lean clay (CL)		Very good

WES FORM 1000
MAR 1958

(4 of 4 sheets)

Table 3

Climatic Data*

Month	Average Daily Temperature, F		Average Precipitation, in.	
	Max	Min	Rainfall	Snowfall
January	51	29	1.1	1.4
February	56	33	0.9	2.1
March	62	38	1.5	0.9
April	75	50	1.6	Trace
May	82	60	5.9	Trace
June	92	69	2.9	Trace
July	96	73	2.1	--
August	97	73	1.1	--
September	89	64	1.7	--
October	76	53	3.0	Trace
November	63	38	0.4	0.4
December	53	31	1.3	1.9
Annual	74	51	23.5	6.7

* Compiled by U. S. Air Force Weather Squadron at AAFB.

Table 4

DATE: May 1972

SUMMARY OF DATA - RIGID PAVEMENT CONDITION SURVEY

AIRFIELD: Altus AFB, Oklahoma

FEATURE NO.	FEATURE DESIGNATION	SLAB SIZE FT	APPROX NO. OF SLABS	PAVE. THICK IN.	NO. OF SLABS CONTAINING INDICATED DEFECTS																% OF SLABS NO DEFECTS	% OF SLABS NO MAJOR DEFECTS	CONDITION
					I	—	\	Δ	*	K	~	S	J	↓	J	⊕	M	P	O	C	D			
R1A	N-S runway, S end; 1st 300 ft	25 by 25	144	16	1						3		3		2				20			80.0	99.3	Excellent
R2A R3D	N-S runway, S end; 200 ft of 1st 500 ft	25 by 25	96	21-23							1		1		1		1		14			81.5	100.0	Excellent
R4B R6C	N-S runway; center 75 ft, sta 5+00 to 124+40	25 by 25	1434	19-21			1	1			3		43	2	46				61			89.5	99.9	Excellent
R11B R10A	N-S runway, N end; 1st 1000 ft	25 by 25	480	16		1	4	4			4		5	1	9		5		31			80.9	98.1	Excellent
	Intersection of taxiway 2 and N-S runway	25 by 25	52	19										2								96.2	100.0	Excellent
T10B	Taxiway 1	25 by 25	282	18	5			1			5				2		1					95.4	97.9	Excellent
T7C	Taxiway 2	25 by 25	102	21									1						1			98.0	100.0	Excellent
T8C	Taxiway 3	25 by 25	72	15																1		98.6	100.0	Excellent
T3A TNA	Taxiway 5 Sta -2+72 to 106+33	25 by 25	907	23							1		8	2	2				24			95.9	100.0	Excellent
T2A	Taxiway 5 sta 106+33 to 132+73	25 by 25	318	18	6	1					2		4		8				3			92.8	97.8	Excellent

REMARKS:

LEGEND:

I	LONGITUDINAL CRACK	~	SHRINKAGE CRACK	M	MAP CRACKING
—	TRANSVERSE CRACK	S	SCALING	P	PUMPING JOINT
\	DIAGONAL CRACK	J	SPALL ON TRANSVERSE JOINT	O	POP-OUT
Δ	CORNER BREAK	↓	SPALL ON LONGITUDINAL JOINT	C	UNCONTROLLED CONTRACTION CRACK
*	SHATTERED SLAB	J	CORNER SPALL	D	"D" CRACKING
K	KEYED JOINT FAILURE	⊕	SETTLEMENT		

WES FORM NO. 2004
JUN 1972

(1 of 2 sheets)

Table 4 (Continued)

DATE: May 1972

SUMMARY OF DATA - RIGID PAVEMENT CONDITION SURVEY

AIRFIELD: Altus AFB, Oklahoma

FEATURE NO.	FEATURE DESIGNATION	SLAB SIZE FT	APPROX NO. OF SLABS	PAVE. THICK. IN.	NO. OF SLABS CONTAINING INDICATED DEFECTS																% OF SLABS NO DEFECTS	% OF SLABS NO MAJOR DEFECTS	CONDITION
					I	—	\	Δ	✳	K	~	S	J	↓	J	⊕	M	P	O	C	D			
T1A	Taxiway 5, N end	25 by 25	152	16	2	1		1			2				2		1		3			92.8	97.4	Excellent
T11B	Taxiway 6 and parking stubs	25 by 25	504	26							2		1		4				2			98.2	100.0	Excellent
T12B	Taxiway 7 and parking stubs	25 by 25	340	26								1							1			99.4	100.0	Excellent
A10B	Operational apron	25 by 25	2055	16	79	2	13	1			40		3		2				50			91.2	95.5	Very good
A1B A2B A3B A11B	South wing parking apron, taxiway, and wash rack	25 by 20	1632	21 26 24 16			1						9	2	10				10			98.0	99.9	Excellent
A4B A5B	Center wing parking apron	25 by 20	1660	21 19				2				5	9	2	2		2		19			97.7	99.9	Excellent
A7B	North wing parking apron	25 by 25	1157	19	4			1					4	9	14				35			93.9	99.6	Excellent
A8B A9B	North wing parking apron extension	25 by 25	740	16 18	4			1			1		2		3				11			97.0	99.3	Excellent
A12B	North warm-up apron	25 by 25	270	16	2			3			4				3				14	1		92.0	98.1	Excellent

REMARKS:

LEGEND:

I	LONGITUDINAL CRACK	~	SHRINKAGE CRACK	M	MAP CRACKING
—	TRANSVERSE CRACK	S	SCALING	P	PUMPING JOINT
\	DIAGONAL CRACK	J	SPALL ON TRANSVERSE JOINT	O	POP-OUT
Δ	CORNER BREAK	↓	SPALL ON LONGITUDINAL JOINT	C	UNCONTROLLED CONTRACTION CRACK
✳	SHATTERED SLAB	J	CORNER SPALL	D	"D" CRACKING
K	KEYED JOINT FAILURE	⊕	SETTLEMENT		

WES FORM NO. 2004
JUN 1972

(2 of 2 sheets)

Table 5

SUMMARY OF PAVEMENT EVALUATION

NAME OF AIRFIELD: Altus AFB, Oklahoma DATE OF EVALUATION MONTH: May YR: 1972			LOAD-CARRYING CAPACITY IN LB OF GROSS PLANE LOAD FOR INDICATED LANDING GEAR TYPES AND CONFIGURATIONS										
			TRICYCLE ARRANGEMENT									BICYCLE	
FEATURE		PAVEMENT OPERATIONAL USE	SINGLE 100-PSI TIRE PRESSURE	SINGLE 100-SQ-IN. CONTACT AREA	SINGLE 241-SQ-IN. CONTACT AREA	TW 28-IN. C-C 226-SQ-IN. CONTACT AREA EACH TIRE	SINGLE TANDEM 60-IN. SPACING 400-SQ-IN. CONTACT AREA	TW 37-IN. C-C 267-SQ-IN. CONTACT AREA EACH TIRE	TW 44-IN. C-C 630-SQ-IN. CONTACT AREA EACH TIRE	TWIN TANDEM 33-IN. X 48-IN. 208-SQ-IN. CONTACT AREA EACH TIRE	C-5A GEAR CONFIGURATION	TWIN TWIN SPCG 37-62-37 267-SQ-IN. CONTACT AREA EACH TIRE	REMARKS
NO.	DESIGNATION		1	2	3	4	5	6	7	8	9	10	
R1A	N-S runway S end, 300 ft of 1st 500 ft	Capacity	145,000	85,000+	155,000+	205,000	200,000+	190,000	230,000+	330,000	800,000+	285,000	
R2A	N-S runway S end, 200 ft of 1st 500 ft center portion	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	510,000	
R4B	N-S runway S end, center 75 ft of 2nd 500 ft	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	480,000	
R6C	N-S runway Interior portion center 75 ft	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	550,000	
R10A	N-S runway N end 1st 500 ft	Capacity	150,000	85,000+	155,000+	205,000	200,000+	195,000	230,000+	330,000	800,000+	290,000	
R11B	N-S runway N end 2nd 500 ft	Capacity	150,000	85,000+	155,000+	205,000	200,000+	230,000	230,000+	380,000+	800,000+	310,000	
T1A	Taxiway 5 Sta 140+82 to 132+73	Capacity	150,000	85,000+	155,000+	205,000	200,000+	195,000	230,000+	330,000	800,000+	290,000	
T2A	Taxiway 5 Sta 106+33 to 132+73	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	230,000	230,000+	380,000+	800,000+	340,000	
T3A	Taxiway 5 Sta 74+33 to 106+33	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	510,000	
T4A	Taxiway 5 Sta -2+72 to 74+33, center	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	460,000	

Note: + sign denotes allowable gross loading greater than maximum gross weight of any existing aircraft having indicated gear configuration.
(a) denotes allowable gross loading less than minimum gross weight of any existing aircraft having indicated gear configuration.

WES FORM NO. 999 EDITION OF AUG 1960 IS OBSOLETE.
JUNE 1972

Table 5 (Continued)

SUMMARY OF PAVEMENT EVALUATION

NAME OF AIRFIELD: Altus AFB, Oklahoma DATE OF EVALUATION MONTH: May YR: 1972			LOAD-CARRYING CAPACITY IN LB OF GROSS PLANE LOAD FOR INDICATED LANDING GEAR TYPES AND CONFIGURATIONS										
			TRICYCLE ARRANGEMENT									BICYCLE	REMARKS
FEATURE		PAVEMENT OPERATIONAL USE	SINGLE 100-PSI TIRE PRESSURE	SINGLE 100-SQ-IN. CONTACT AREA	SINGLE 241-SQ-IN. CONTACT AREA	TW 28-IN. C-C 226-SQ-IN. CONTACT AREA EACH TIRE	SINGLE TANDEM 60-IN. SPACING 400-SQ-IN. CONTACT AREA	TW 37-IN. C-C 267-SQ-IN. CONTACT AREA EACH TIRE	TW 44-IN. C-C 630-SQ-IN. CONTACT AREA EACH TIRE	TWIN TANDEM 33 IN. × 48 IN. 208-SQ-IN. CONTACT AREA EACH TIRE	C-5A GEAR CONFIGURATION	TWIN TWIN SPCG 47-62-37 267-SQ-IN. CONTACT AREA EACH TIRE	
NO.	DESIGNATION		1	2	3	4	5	6	7	8	9	10	
T7C	Taxiway 2	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	590,000	
T8C	Taxiway 3	Capacity	150,000	85,000+	155,000+	210,000	200,000+	235,000	230,000+	380,000+	800,000+	315,000	
T9C	Taxiway 4	Capacity	140,000	60,000	110,000	140,000	200,000+	220,000	230,000+	310,000	800,000+	360,000	
T10B	Taxiway 1	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	255,000	230,000+	380,000+	800,000+	330,000	
T11B	Taxiway 6 and stubs	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	600,000+	
T12B	Taxiway 7 and stubs	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	600,000+	
A1B	South wing parking apron	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	440,000	
A2B	South wing parking apron channelized traffic lane	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	600,000+	
A3B	South wing parking apron channelized traffic lane	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	530,000	
A4B	Center wing parking apron	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	440,000	
A5B	Center wing parking apron west side	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	320,000	230,000+	380,000+	800,000+	410,000	
A6B	Center wing parking apron east side	Capacity	105,000	45,000	80,000	100,000	155,000	155,000	175,000	195,000	570,000	(a)	
A7B	North wing parking apron	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	320,000	230,000+	380,000+	800,000+	410,000	
A8B	North wing parking apron extension	Capacity	145,000	85,000+	155,000+	200,000	200,000+	225,000	230,000+	380,000+	800,000+	300,000	

WES FORM NO. 999
JUNE 1972

EDITION OF AUG 1960 IS OBSOLETE.

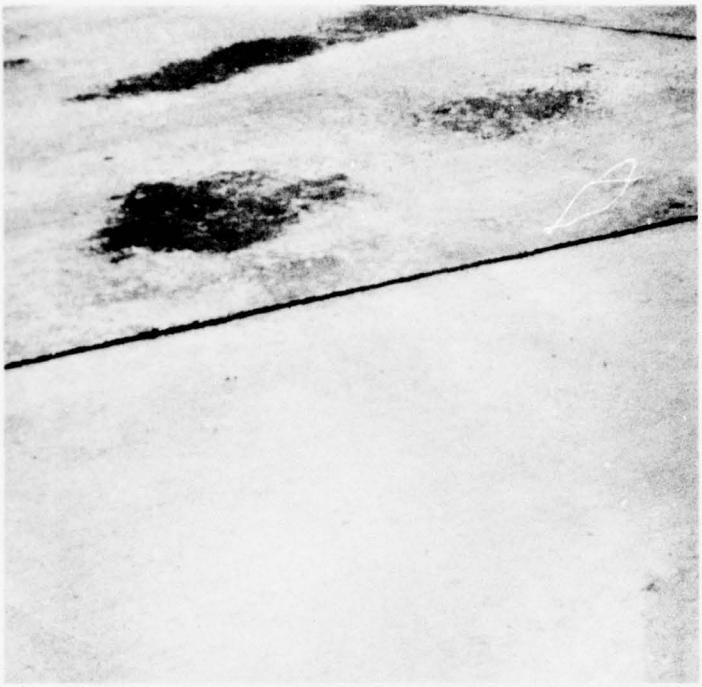


Photo 1. Scaling due to jet engine blast; south end of taxiway 5

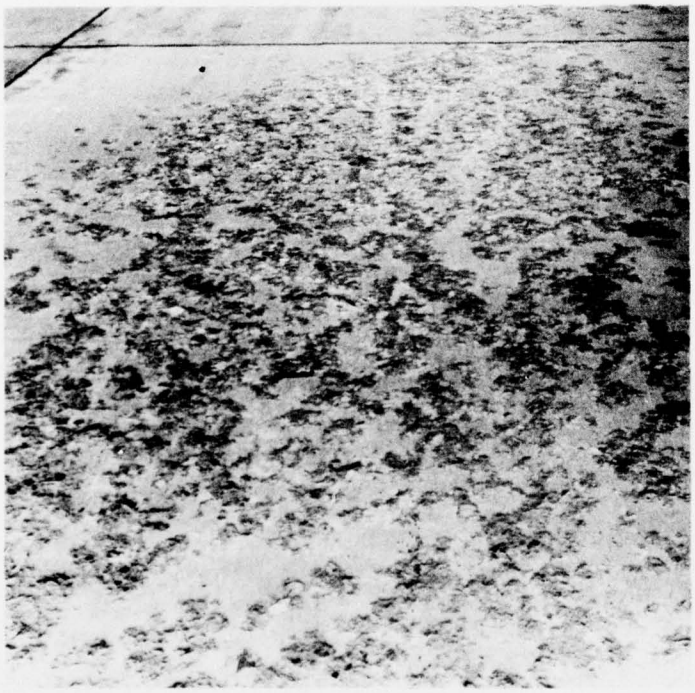


Photo 2. Fire-damaged slab in center wing parking apron

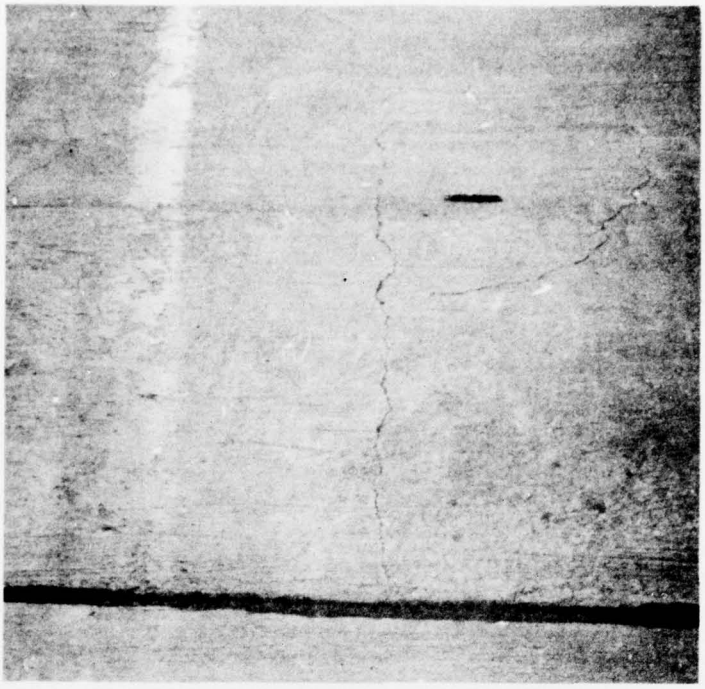


Photo 3. Thin bonded overlay on center wing parking apron

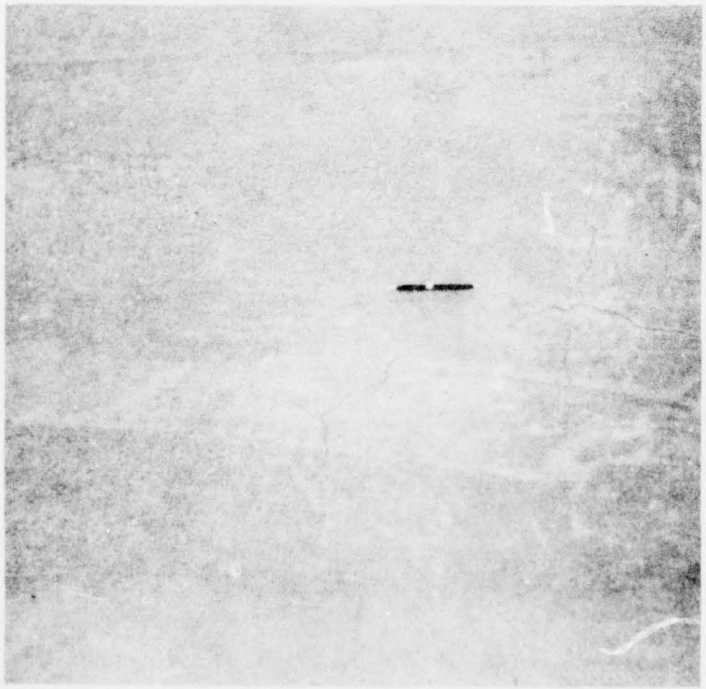
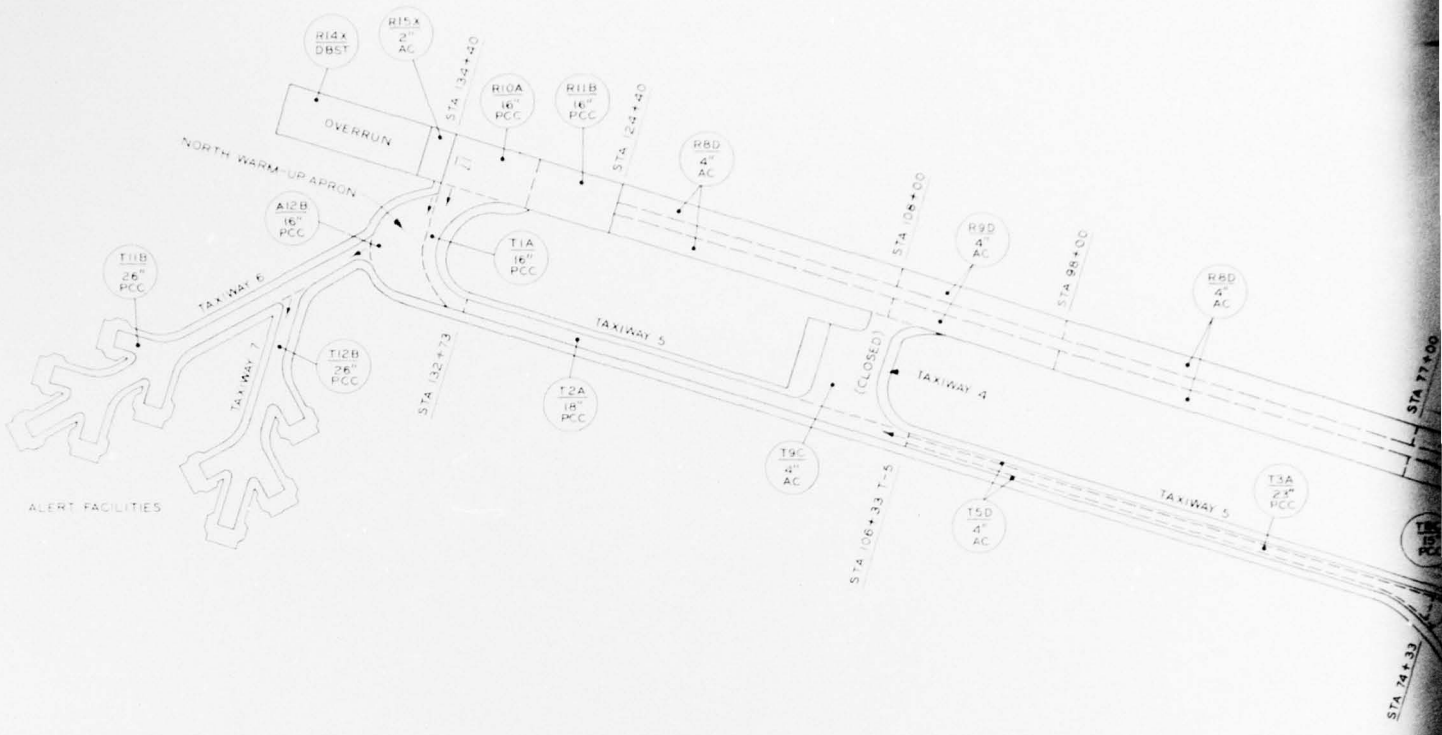


Photo 4. Thin bonded overlay on center wing parking apron

Photo 5. Cracking and rutting of AC pavement, south of taxiway 2 and adjacent to center wing parking apron

Photo 6. Cracking and rutting of AC pavement, south of taxiway 2 and adjacent to center wing parking apron



LEGEND

R2x / 2" AC ← FEATURE DESIGNATION (SEE NOTE 1)
← SURFACE PAVEMENT THICKNESS AND TYPE

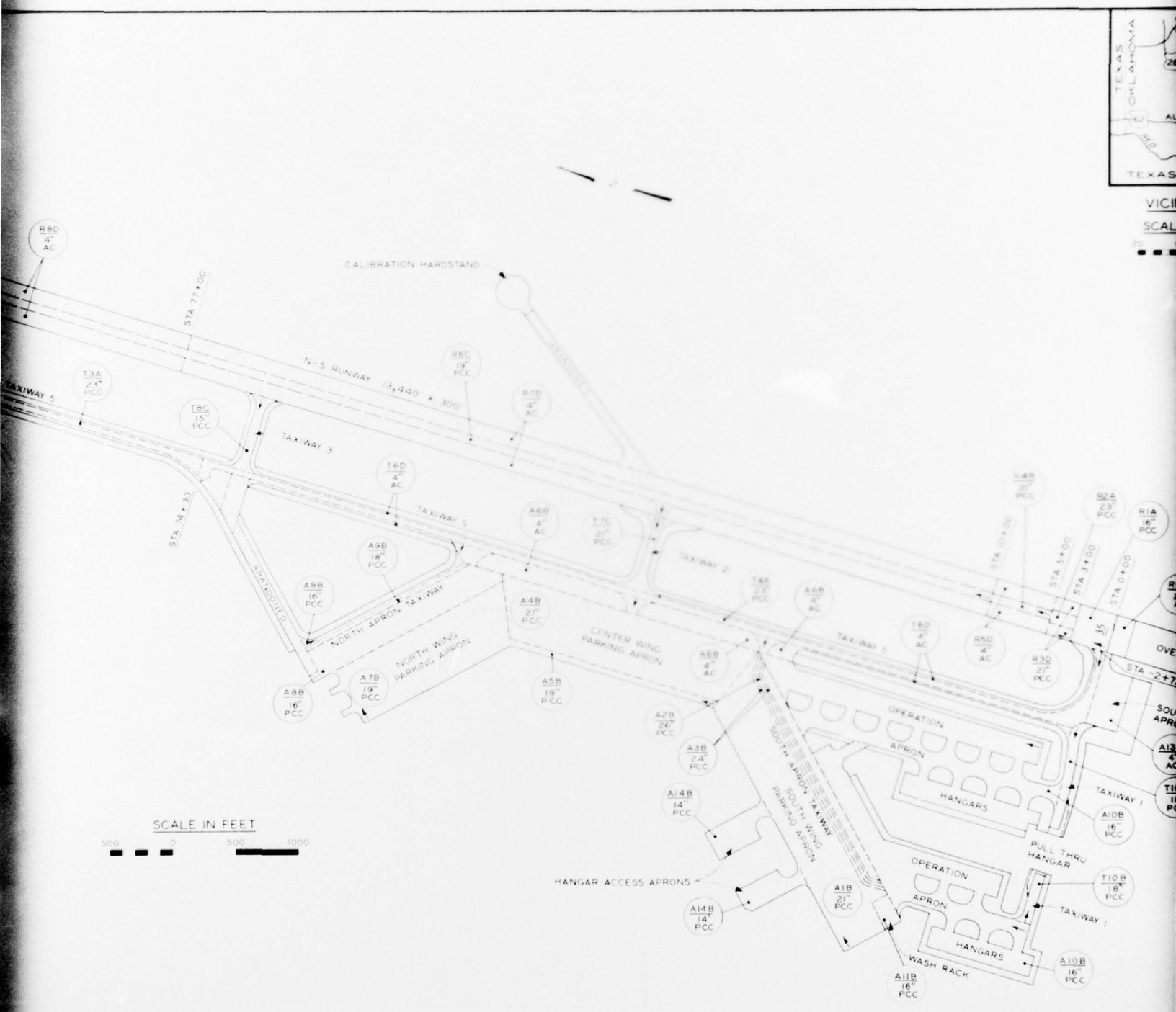
TYPE OF FEATURE
- R - RUNWAY
- T - TAXIWAY
- A - APRON

TYPE TRAFFIC AREA (SEE NOTE 2)
- A - A TYPE TRAFFIC
- B - B TYPE TRAFFIC
- C - C TYPE TRAFFIC
- D - D TYPE TRAFFIC
- X - NO TRAFFIC TYPE ASSIGNED

AC - ASPHALTIC CONCRETE
PCC - PORTLAND CONCRETE CEMENT
DBST - DOUBLE BITUMINOUS SURFACE TREATMENT
→ DIRECTION OF SURVEY

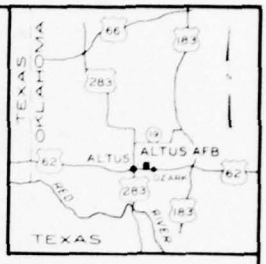
SCALE
500 0

NOTES: 1. FEATURE DESIGNATION DENOTES TYPES OF FEATURE, NUMBER OF FEATURE FOR GIVEN TYPE, AND TYPE TRAFFIC AREA.
2. TRAFFIC AREA DESIGNATIONS ARE BASED ON HEAVY LOAD CRITERIA.



ALTUS A

AIRFIELD L



VICINITY MAP

SCALE IN MILES

20 0 20 40

CALIBRATION HARDSTAND

ARM/DISARM

N-S RUNWAY 13,440' x 300'

R6C 19" PCC

R7D 4" AC

TAXIWAY 3

T6D 4" AC

TAXIWAY 5

A6B 4" AC

T7C 21" PCC

TAXIWAY 2

T4A 23" PCC

A6B 4" AC

A9B 18" PCC

A8B 16" PCC

ARM/DISARM

NORTH APRON TAXIWAY

A4B 21" PCC

NORTH WING PARKING APRON

CENTER WING PARKING APRON

A5B 19" PCC

A7B 19" PCC

A8B 16" PCC

A6B 4" AC

T6D 4" AC

R5D 4" AC

R3D 21" PCC

R4B 21" PCC

R2A 23" PCC

R1A 16" PCC

R13X 2" AC

STA 10+00

STA 5+00

STA 3+00

STA 0+00

35

OVERRUN

STA -2+72

R12X DBST

SOUTH WARM-UP APRON

A13B 4" AC

T10B 18" PCC

A10B 16" PCC

TAXIWAY 1

PULL THRU HANGAR

OPERATION APRON

HANGARS

A2B 26" PCC

A3B 24" PCC

A14B 14" PCC

SOUTH APRON TAXIWAY

SOUTH WING PARKING APRON

HANGAR ACCESS APRONS

A14B 14" PCC

A1B 21" PCC

A11B 16" PCC

WASH RACK

FEET

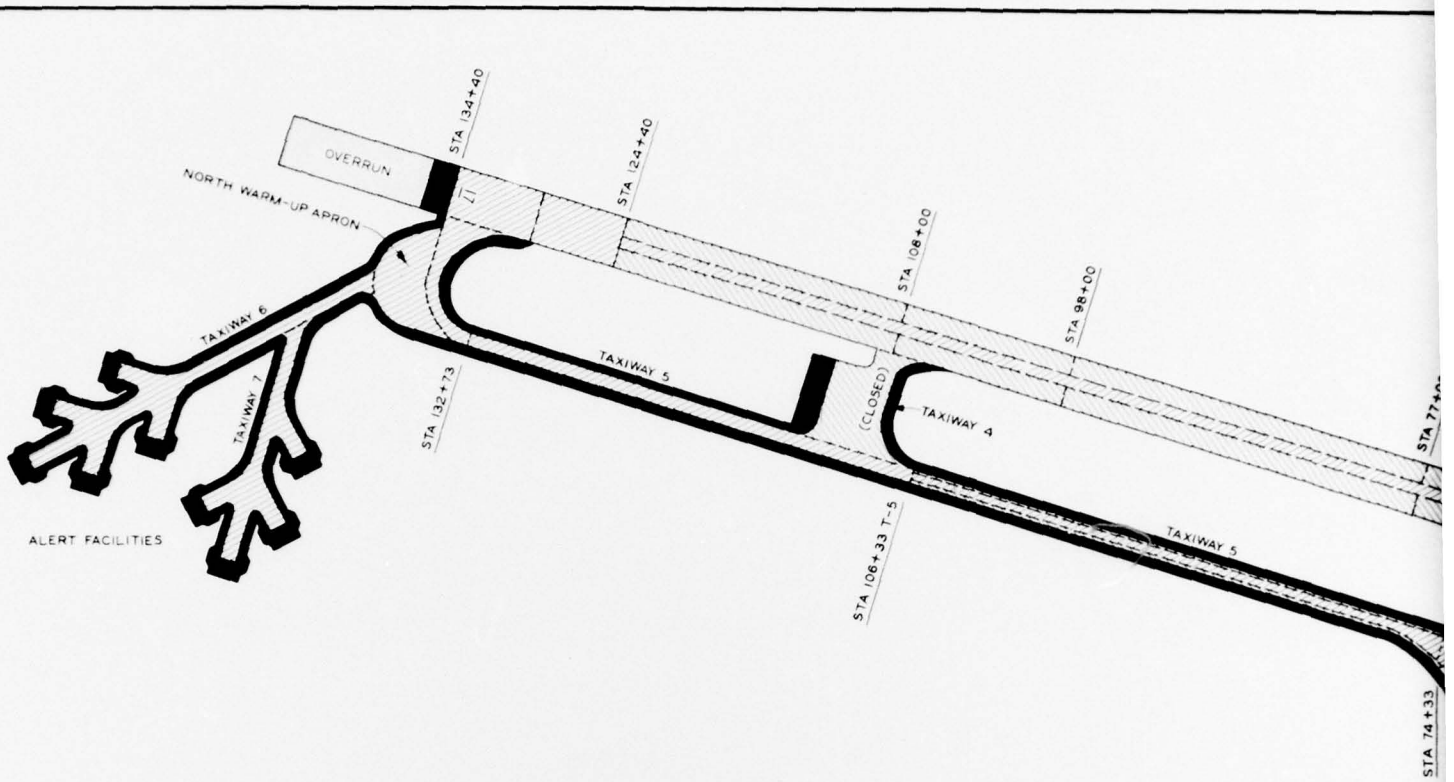
500 1000

ALTUS AFB

AIRFIELD LAYOUT

PLATE 1

3

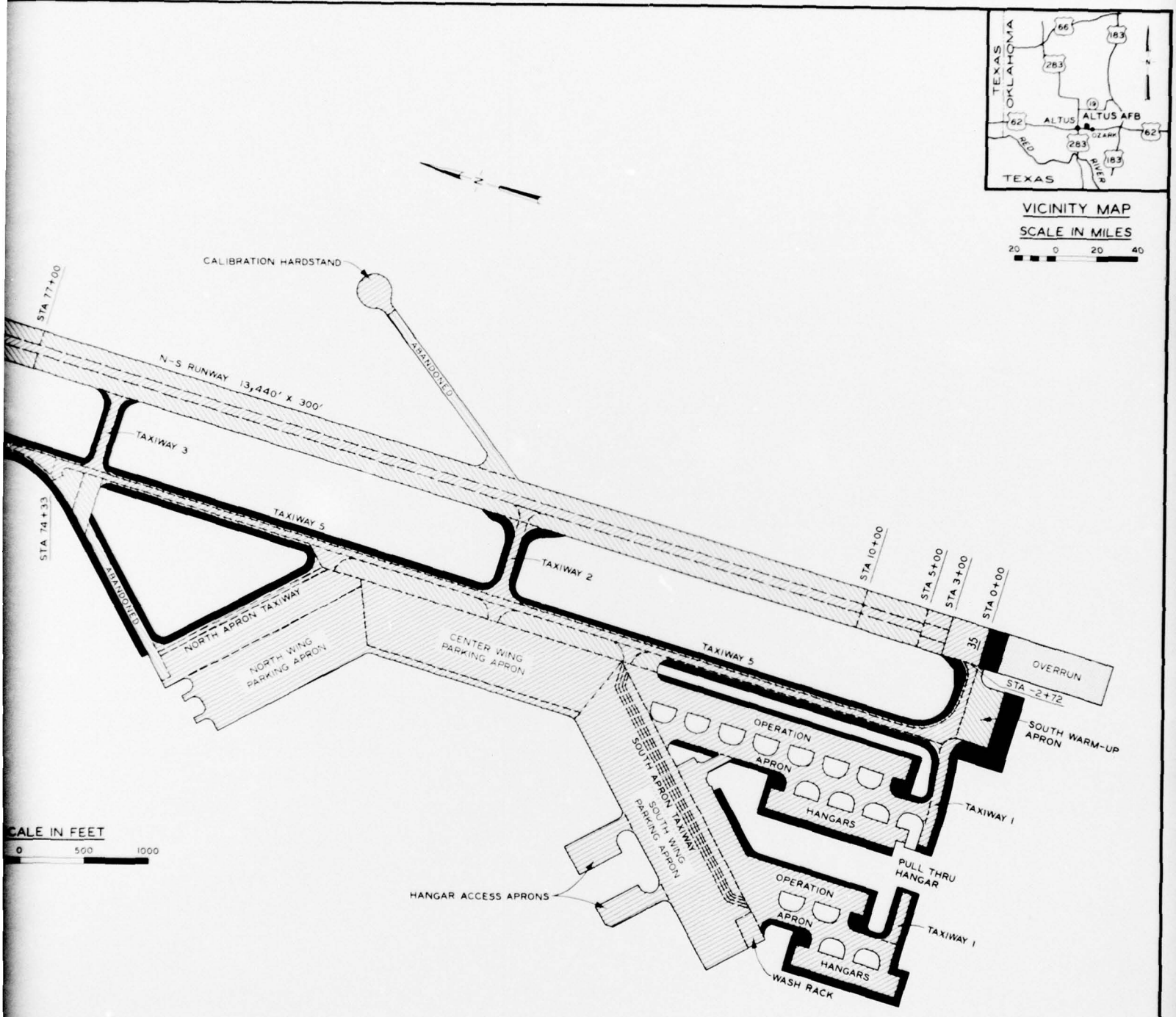


LEGEND

- PORTLAND CEMENT CONCRETE (PCC)
- ASPHALTIC CONCRETE (AC)
- BLAST PAVEMENT (AC-NON TRAFFIC)
- DOUBLE BITUMINOUS SURFACE TREATMENT

SCALE IN

500 0



ALTUS AFB

PAVEMENT PLAN

PLATE 2

2